

10/572593

IAPO Rec'd PCT/PTO 20 MAR 2006

International Patent Application No. PCT/NZ2004000216  
Attorney Docket No. KELL3013/JEK

**ANNEX TO INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY**

received 15 August  
2005**Claims**

1. A material comprising an intimate mixture of keratin protein and a water soluble polymer, the polymer selected from the group comprising:
  - (a) poly (vinyl alcohol) (PVA) and
  - (b) poly (vinyl pyrrolidone) (PVP).
2. A material according to claim 1 wherein the keratin protein is s-sulfonated.
3. A material according to claim 1 or claim 2 wherein the keratin protein is a keratin protein fraction.
4. A material according to claim 3 in which the keratin protein fraction is from the intermediate filament protein family.
5. A material according to any one of claims 1-4 in which the keratin protein is intact.
6. A material according to any preceding claim in which the material is a film, fibre or membrane.
7. A method for making a material comprising
  - (a) mixing a keratin protein and a water soluble polymer to form an intimate mixture, the polymer selected from the group comprising:
    - i. poly (vinyl alcohol) (PVA) and
    - ii. poly (vinyl pyrrolidone) (PVP).
  - (b) casting the aqueous mixture so produced; and
  - (c) drying to create a material.
8. A method for making a material comprising:
  - (a) mixing a keratin protein and a water soluble polymer to form an intimate mixture, the polymer selected from the group comprising
    - i. poly (vinyl alcohol) (PVA) and
    - ii. poly (vinyl pyrrolidone) (PVP)
  - (b) extruding the aqueous mixture produced from step (a) into a coagulation bath through a process of wet spinning.

Amended Sheet  
IPEA /AU.

received 15 August 2005

9. A method for improving the physico-mechanical properties of the materials produced by any one of claims 7-8 by introducing a cross-linker agent to form disulfide bonds and thus remove sulfonate functionalities.
10. A method according to claim 9 in which the cross-linking agent used as a reductant is a thiol or thioglycollate salt.
11. The method according to claim 9 or claim 10 in which the physico-mechanical properties are wet and dry strength.
12. A method according to claim 10 in which the thioglycollate salt is ammonium thioglycollate solution.
13. The method according to any one of claims 7-12 wherein the keratin protein is s-sulfonated.
14. The method according to any one of claims 7-13 wherein the keratin protein is a protein fraction.
15. The method according to claim 14 wherein the keratin protein is from the intermediate filament protein family.
16. The method according to any one of claims 7-15 in which the keratin protein is intact.
17. A method of improving the wet strength properties of the materials produced by the method of any one of claims 7-8 by incorporating a cross-linking agent into them.
18. A method according to claim 17 in which the cross-linking agent is a protein in to the intimate mixture.
19. A method according to claim 17 in which the cross-linking agent is selected from the group consisting of formaldehyde and glutaraldehyde.
20. A process for improving the mechanical properties of a material produced by a method of any one of claims 7-8 by heat treating the composite matrix to enhance its crystalline properties.

Amended Sheet  
IPEA / AU

Received 15 August 2005

21. A keratin protein derivative material in which the keratin is chemically linked to a monomer or a polymer material.
22. A keratin protein derivative according to claim 21 in which the keratin protein is s-sulfonated.
23. A keratin protein derivative according to claim 21 in which the keratin is a keratin protein fraction.
24. A keratin protein derivative according to claim 23 in which the keratin protein fraction is from the intermediate filament protein family.
25. A keratin protein derivative according to any one of claims 21-24 in which the keratin is intact.
26. A keratin protein derivative according to any one of claims 21-25 in which the monomer or polymer material is from the acrylate, epoxide or anhydride group.
27. A keratin homopolymer material according to any one of claim 21-26 which is further polymerised.
28. A keratin material according to claim 27 in which has been further polymerised in the presence of an additional monomer from the acrylate, epoxide or anhydride group, to form a keratin copolymer material.

Amended Sheet

10/11/11